

CLAIMS

WHAT IS CLAIMED IS:

1. A method for differentiating or transdifferentiating cells to produce an edible meat product, the method comprising:
 - (a) delivering nucleic acid molecules comprising one or more ribonucleic acid (RNA) molecules into said cells;
 - (b) modulating gene expression of said cells with aid of said nucleic acid molecules or expression products thereof, to differentiate or transdifferentiate at least a subset of said cells to generate one or more target cells following delivery of said nucleic acid molecules, wherein upon said modulating, said nucleic acid molecules are not integrated into a genome of said cells; and
 - (c) producing said edible meat product using at least partially said one or more target cells generated in (b).
2. The method of claim 1, wherein said nucleic acid molecules comprise two or more different RNA molecules.
3. The method of claim 1, wherein said cells comprise porcine cells.
4. The method of claim 1, wherein (c) comprises producing a tissue from said one or more target cells.
5. The method of claim 1, wherein said one or more target cells comprise at least two different types of cells.
6. The method of claim 5, further comprising co-culturing said at least two types of target cells to generate a three-dimensional tissue.
7. The method of claim 1, wherein said RNA molecules comprise MYOD1, MYOG, MYF5, MYF6, PAX3, or PAX7, or any combination or variant thereof.
8. The method of claim 1, wherein at least one of said RNA molecules is chemically modified to improve its stability.
9. The method of claim 1, wherein said nucleic acid molecules are delivered to said cells with neutral or anionic liposomes, cationic liposomes, lipid nanoparticles, ionizable lipids, or any combination or variation thereof.
10. The method of claim 1, wherein said nucleic acid molecules are delivered in a single dose to said cells.

11. The method of claim 1, wherein said nucleic acid molecules are delivered in at least two doses to said cells.
12. The method of claim 11, wherein individual doses of said at least two doses are delivered at least 3 days apart.
13. The method of claim 1, wherein said nucleic acid molecules are delivered at a concentration of at most 500 nM.
14. The method of claim 1, wherein said nucleic acid molecules comprise siRNA targeting POU5F1 (OCT3/4), KLF4, SOX2, or any combination or variant thereof.
15. A method of generating an edible meat product from cells, comprising:
 - (a) bringing said cells in contact with a scaffold;
 - (b) subjecting at least a subset of said cells to a differentiation or a transdifferentiation process in the presence of said scaffold and with the use of a growth factor or a nucleic acid molecule, to thereby generate a tissue; and
 - (c) producing said edible meat product using said tissue.
16. The method of claim 15, wherein said scaffold is degradable, and wherein said edible meat product optionally comprises at least a portion of said scaffold.
17. The method of claim 16, wherein said scaffold degrades at a rate of at least 1% per day during (b).
18. The method of claim 15, further comprising at least one of culturing said cells and subjecting said cells to one or more expansion processes to expand said cells.
19. The method of claim 16, wherein said scaffold is configured to facilitate cell expansion during said one or more expansion processes in a bioreactor chamber.
20. The method of claim 15, wherein (b) comprises generating differentiated or transdifferentiated cells from said cells, and optionally fusion of said differentiated or transdifferentiated cells within said scaffold.
21. The method of claim 15, further comprising releasing cells of said at least said subset of said cells from said scaffold, and depositing said released cells on a surface of a separate scaffold.
22. The method of claim 21, wherein, at least 50% of fusion of said differentiated or transdifferentiated cells occurs prior to said releasing.

23. The method of claim 18, wherein at least one of said culturing and said expansion process is conducted in the presence of said scaffold.
24. The method of claim 18, wherein said culturing and said one or more expansion processes are performed in a same bioreactor chamber.
25. The method of claim 18, wherein said culturing is performed in a bioreactor chamber and said one or more expansion processes are performed in an additional bioreactor chamber.
26. The method of claim 25, further comprising directing at least a subset of cultured cells from said bioreactor chamber to said plurality of additional bioreactor chambers to perform a plurality of expansion processes.
27. The method of claim 26, wherein expansion processes of said plurality of expansion processes are performed sequentially, simultaneously, or a combination thereof.
28. The method of claim 26, further comprising directing a medium through said bioreactor chamber and an additional bioreactor chamber of said plurality of additional bioreactor chambers to facilitate said culturing or said one or more expansion processes.
29. The method of any one of claims 28, further comprising filtering said medium directed out of said additional bioreactor chamber to remove undesired components from said medium, thereby generating a filtered medium.
30. The method of claim 29, further comprising recycling said filtered medium into said bioreactor chamber.
31. The method of claim 15, wherein said cells comprise animal derived stem cells.
32. The method of claim 31, wherein said cells comprise porcine cells.
33. The method of claim 15, wherein said edible meat product is in a unit form of at least 50 grams.
34. The method of claim 15, wherein said edible meat product is in a solid state with a texture comparable with that of an *in-vivo* derived steak including loins.
35. The method of claim 15, wherein said edible meat product is incorporated into a further processed food product.
36. A method for generating an edible meat product from cells, the method comprising:
- (a) modulating expression of one or more genes in said cells in a transient and non-integrative manner using two or more ectopic differentiation factors to generate progenitor cells;

(b) differentiating at least a subset of said progenitor cells to generate terminally differentiated cells; and

(c) producing said edible meat product based at least partially on said terminally differentiated cells.

37. The method of claim 36, further comprising subjecting one or more of said cells, said progenitor cells, and said terminally differentiated cells to a culturing and/or an expansion process.

38. The method of claim 37, wherein said culturing and said expansion processes are performed in a same, or different bioreactor chambers.

39. The method of claim 36, wherein said terminally differentiated cells comprise muscle cells, fat cells, somite cells, neural cells, endothelial cells, smooth muscle cells, bone cells, or a combination thereof.

40. The method of any one of claims 36, wherein (b) comprises differentiating said progenitor cells by arresting the cell cycle of cells.

41. The method of claim 36, wherein said ectopic differentiation factors arrest the cell cycle of cells through reducing or removing growth factors from said cells.

42. The method of claim 36, wherein said growth factors comprise LIF, FGF, BMP, activin, MAPK, TGF- β , or any combination thereof.

43. A method for generating an edible meat product using cells, the method comprising:

(a) delivering into said cells two or more different types of nucleic acid molecules comprising messenger ribonucleic acid (mRNA), microRNA (miRNA), transfer RNA (tRNA), silencing RNA (siRNA), or complementary deoxyribonucleic acid (cDNA);

(b) modulating gene expression of said cells with aid of said two or more different types of nucleic acid molecules or expression products thereof, to generate one or more target cells following delivery of said two or more different types of nucleic acid molecules, wherein said modulating is in a transient manner such that said nucleic acid molecules are not integrated into a genome of said cells;

(c) producing said edible meat product using at least partially said one or more target cells generated in (b).

44. The method of claim 43, wherein said two or more different types of nucleic acid molecules comprise mRNA and siRNA.

45. The method of claim 44, wherein said mRNA comprises MYOD1, MYOG, MYF5, MYF6, PAX3, PAX7, or any combination or variant thereof.
46. The method of claim 44, wherein said siRNA targets POU5F1 (OCT3/4), KLF4, SOX2, or any combination or variant thereof.
47. The method of claim 44, wherein said delivering comprises a single dose of said two or more different types of nucleic acid molecules.
48. An edible meat product prepared by a process comprising the steps of:
- (a) bringing a plurality of cells in contact with a scaffold;
 - (b) subjecting at least a subset of said plurality of cells to a differentiation or a transdifferentiation process in the presence of said scaffold and with the use of a growth factor or a nucleic acid molecule, to thereby generate a tissue; and
 - (c) producing said edible meat product using said tissue.
49. The edible meat product of Claim 48, wherein said tissue comprises myocytes and adipocytes, and wherein a ratio of said myocytes to said adipocytes is between 99:1 and 80:20.
50. The edible meat product of any one of Claims 48-49, wherein said edible meat product comprises at least 2% by mass of said scaffold.

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1. A method for differentiating or transdifferentiating cells to produce an edible meat product, the method comprising:
 - (a) delivering nucleic acid molecules comprising one or more ribonucleic acid (RNA) molecules into said cells;
 - (b) modulating gene expression of said cells with aid of said nucleic acid molecules or expression products thereof, to differentiate or transdifferentiate at least a subset of said cells to generate one or more target cells following delivery of said nucleic acid molecules, wherein upon said modulating, said nucleic acid molecules are not integrated into a genome of said cells; and
 - (c) producing said edible meat product using at least partially said one or more target cells generated in (b).
2. The method of claim 1, wherein said nucleic acid molecules comprise two or more different RNA molecules.
3. The method of claim 1 or 2, wherein said cells comprise animal derived stem cells.
4. The method of any one of claims 1-3, wherein said cells comprise porcine cells.
5. The method of any one of claims 1-4, wherein (c) comprises producing a tissue from said one or more target cells.
6. The method of claim 5, wherein said one or more target cells comprise at least two different types of cells.
7. The method of claim 6, further comprising co-culturing said at least two different types of cells to generate a three-dimensional tissue.

8. The method of any one of claims 1-7, wherein said one or more RNA molecules encode MYOD1, MYOG, MYF5, MYF6, PAX3, or PAX7, or any combination or variant thereof.
9. The method of any one of claims 1-8, wherein at least one of said RNA molecules is chemically modified to improve its stability.
10. The method of any one of claims 1-9, wherein said nucleic acid molecules are delivered to said cells with neutral or anionic liposomes, cationic liposomes, lipid nanoparticles, ionizable lipids, or any combination or variation thereof.
11. The method of any one of claims 1-10, wherein said nucleic acid molecules are delivered in a single dose to said cells.
12. The method of any one of claims 1-11, wherein said nucleic acid molecules are delivered in at least two doses to said cells.
13. The method of claim 12, wherein individual doses of said at least two doses are delivered at least 3 days apart.
14. The method of any one of claims 1-13, wherein said nucleic acid molecules are delivered at a concentration of at most 500 nM.
15. The method of any one of claims 1-14, wherein said nucleic acid molecules comprise silencing RNA (siRNA) targeting POU5F1 (OCT3/4), KLF4, SOX2, or any combination or variant thereof.
16. The method of any one of claims 2-15, wherein said two or more different RNA molecules comprise messenger ribonucleic acid (mRNA), microRNA (miRNA), transfer RNA (tRNA), or said siRNA.

17. The method of claim 16, wherein said two or more different RNA molecules comprise said mRNA and said siRNA.
18. The method of claim 17, wherein said mRNA encodes MYOD1, MYOG, MYF5, MYF6, PAX3, PAX7, or any combination or variant thereof.
19. The method of any one of claims 1-18, wherein a chemical modification of said at least one of said RNA molecules comprise anti-reverse cap analogues, 3'-globin untranslated regions, poly-A tail modifications.
20. The method of any one of claims 1-19, wherein said one or more RNA molecules comprise unlocked nucleic acids.